the patient look down. This should be done a number of times a day. The saddest complication is probably an internal hemorrhage during or immediately following the operation. I hope the essayist will never experience one.

Dr. W. H. Dudley, Los Angeles, said: I think I have had my share of complications, but one was reserved for last year, which I had not seen before. A woman, age about seventy, from whom I had extracted a cataract from the right eye three years before, came with a cataract in her left eye. Examination showed it to be mature, but not hyper-mature. The patient was enjoying good health, and examination of the urine was negative. The corneal section was made at the limbus, was correct, and the behavior of the patient was excellent. Almost immediately after the section was made, liquid vitreous began to flow out of the section. With an instrument, the lens was lifted out of the section without further loss of vitreous, and the eye dressed with bandages. The wound healed in forty-eight hours, with little reaction, and a week later the patient could tell the time by the watch with a plus 13 D. lens. Soon, however, some pain was complained of, and slight pericorneal redness persisted, and the tension was —1, which continued for some few months, when she was lost sight of, at which time a pupillary membrane had formed which rendered the eye valueless for sight. This shows that an eye which reacts functionally, as a healthy eye should, with all appearances of a healthy eye, as cataract eyes go, may be diseased after all.

Dr. B. F. Church, Redlands, said: Fixation forceps should be replaced in cataract operation by a small fork. The globe can be held more steadily than can ordinarily be accomplished with the forceps. It has the advantage of not folding up the conjunctiva, and gives a firm resistance for puncture and counter puncture. Its use is less painful to the patient.

Note: The paper was also discussed by Dr. Deitling of Los Angeles, and Dr. L. Deane of San Francisco.

Dr. V. H. Hulen, San Francisco, closing his own paper, stated: He had never had delirium follow extraction, and believes this experience due in great degree to preliminary preparation of patient physically and mentally. He uses Ring mask, and thus dispenses with a dark room, and thoroughly protects eyes from accident. Artificial light would be desirable if we had an inspired person to hold it in required position.

In regard to operation in bed, he would like an operating-room, admitting the bed, and wishes hospital builders would arrange for eye patients, as their requirements are peculiar to themselves, and so necessary for good results. He could touch on but few complications in paper, so limited it to personal experience.

THE PREVENTION OF TUBERCULOSIS IN CHILDREN.*

By T. C. McCLEAVE, M. D., Berkeley.

The finer diagnostic methods of recent years have led many investigators to the conviction that tuberculosis is essentially, in its origin, a disease of childhood. The occurrence, before the age of puberty, of positive tuberculin reactions in almost all individuals tested; the revelations of the Roentgen ray as to the frequency of diseased bronchial and other lymph nodes heretofore largely overlooked; the similar disclosure of incipient lung changes; the significance of all of which, being confirmed by the necropsy findings in the bodies of a large proportion of the children coming to autopsy, indicates that infection with the tubercle bacillus is commonly an incident of very early life.

The ultimate solution of the problem of the eradication of tuberculosis must lie, it would seem, in the prevention of this early infection.

Prophylaxis should begin before conception; that is, no manifestly tuberculous woman should become pregnant. This is a matter, however, at present largely beyond control and many babies must unavoidably come into the world handicapped by such parentage.

This is not to say that the mother transmits tuberculosis directly to her infant in utero, which rarely occurs, or even that she endows it with a peculiar susceptibility to the disease, as has been so generally taught; but the child of a sick mother is necessarily born with impaired vitality into an environment which offers exceptional opportunity for early infection. The association of mother and infant is ordinarily so close that a mother with open tuberculosis could only by most extraordinary precaution avoid infecting the child, and the danger is but little less where the father or other members of the household are tuberculous.

Ten thousand children under five years of age die of tuberculosis each year in the United States, and of these seventy-five per cent. are of tuberculous parentage. A small proportion of these cases are possibly of the true congenital type, while a few others may perhaps have been infected at the time of birth, but the source of infection in the great majority is of course the sputum of the mother or other tuberculous member of the family. The evidence is indubitable that tuberculosis is preeminently a house disease, and that early life is the period of greatest susceptibility.

Not only is maternal tuberculosis an important consideration in respect to the future welfare of the expected child, but is of tremendous importance in respect to the usual disastrous effect of child-bearing on tuberculous women.

Tuberculosis is one of the gravest complications of pregnancy and may, in a considerable proportion of cases, present a definite indication for therapeutic abortion. It is estimated (Bacon) that there are about 32,000 tuberculous women pregnant every year in the U. S. Between 44,000 and 48,000 women of child-bearing age die of tuberculosis every year, about one-fourth of whom have passed through pregnancy within the year, or in other words, one-third of all tuberculous pregnant women die within one year. These figures, with what has previously been said of the infection of the offspring of these women, gives some

*Read before the Alameda County Medical Society, September, 1913.

idea of the importance of the problem of motherhood in tuberculous women, as regards society in general, but especially in reference to incidence of the disease in children.

For her own sake and that of her child, the tuberculous woman coming to labor should be treated in a well equipped hospital, for these cases require much more than ordinary obstetric care, and only in a hospital can labor be so conducted as to insure the mother passing through the ordeal with as little expenditure of her strength as possible, little loss of blood or risk of infection, proper supervision of the puerperium, thorough isolation of the child, and skilled attention to its dietetic and hygienic needs from birth. In the hospital, also, is afforded an excellent opportunity for the instruction of the mother in the principles of personal and family hygiene essential to the proper care of the child after leaving the institution.

Statistics, as quoted, show that but little has yet been accomplished in the control of the disease in this class of patients. C. S. Bacon, however, in a paper read at the Minneapolis session of the A. M. A. described a plan of treatment for them which has been adopted by the Chicago Municipal Tuberculosis Sanatorium, and which promises to have far-reaching results. His proposal is that there shall be established in connection with tuberculosis sanatoria maternity departments in which expectant mothers shall be cared for not only during labor and later, but throughout at least the latter months of pregnancy. As many of these women will be found to already have one or more children, and as they neither can nor will, in most instances, leave them at home while they themselves are in the sanatorium, some provision must be made for the children. Moreover, many of these little ones are themselves already infected, and in need of medical supervision, hence it is proposed that there shall also be established a department for the care of these dependent children while the mother is in the institution. The whole plan is so sane, and so fundamental in principle, that it should make an immediate appeal to all those interested in the problem of tuberculosis control.

A child born of a tuberculous mother or into a tuberculous family must receive the most scrupulous care to prevent its being unduly exposed to contagion. It should, so far as possible, be isolated from the afflicted members of the household. If the mother be tuberculous, isolation, unless she be too ill to care, may seem harsh and extreme, but it should be insisted upon, for I believe that there are but few mothers who, in constant association with their babies, could be restrained from fondling them, or who, having open tuberculosis, could be successfully taught to so care for their personal hygiene as to eliminate the danger to the infant.

A baby should not be suckled by a tuberculous mother. In certain instances, it would no doubt be safe to draw the milk from the breasts and feed it to the infant, but this should only be done after determination of its innocuousness by bacteriologic investigation. Unless bacilli were found in the milk, inoculation experiments would alone be conclusive, and the amount of time required for these, some weeks at least, would render the method impracticable. It would seem wise, therefore, to make no attempt to use the mother's milk, for fear that it may contain living bacilli, even if it were well for the mother to attempt lactation. As these children must consequently be artificially fed from birth, except where wet-nursing can be resorted to, their nutritive needs should be a matter of extreme concern, and every effort should be made to overcome or obviate congenital physical deficiencies by a proper dietary and careful attention to the babies' hygiene.

Milk from tuberculous cattle is the second great factor in the causation of the disease in children. Tuberculosis, as is well known, is very common in many species of animals, and prior to 1896, the unity of the disease in man and animals and its transmissibility from one to the other was unquestioned. In that year, however, Theobald Smith first described certain cultural and other differences in the bacilli derived from human and bovine sources, a discovery which at once caused doubts to be expressed as to the identity of the disease in the two species, and led to Koch's famous statement in 1901, at the British Congress on Tuberculosis, that tuberculosis in man and tuberculosis in animals are different diseases; that it is impossible to transmit the disease from one to the other; and that man need not fear infection from cattle, either through eating the meat or drinking the milk of tuberculous animals.

This sensational assertion has long since been controverted by most conclusive evidence. Indeed, some almost equally authoritative bacteriologists hold that milk from tuberculous cattle is perhaps the chief source of infection in young children. Von Behring has been foremost in advocating this opinion, while Sims-Woodhead in England, Orth in Germany, and Ravenel in this country are among the leading exponents of the theory that bovine infection in man is far more common than is conceded by most investigators. It is held that even pulmonary tuberculosis may arise from the ingestion of tubercle bacilli, which, passing through the uninjured intestinal mucosa, reach the lungs by way of the mesenteric lymphatics and blood stream; a possibility which has been amply demonstrated by experimental methods. The extreme rarity of pulmonary cases yielding bovine bacilli, only two or three such having been reported, is ascribed to metamorphosis of the bacilli by long habitat in the human body. That such metamorphosis may occur is to be expected from the known behavior of other bacteria under differing environments, and some evidence has been adduced to prove its possibility in respect to tubercle bacilli. This controversial phase of the subject is beyond the scope of the present paper, however, and has been discussed elsewhere by the writer.[1]

Taking as a criterion the presence of bacilli of persistent bovine type, it may be said with certainty that those forms of the disease which are found

1 McCleave: Amer. Jour. Dis. of Children, 1914, viii, 210.

almost exclusively during early life, such as glandular, bone, abdominal and generalized tuberculosis in young children, are very largely due to bovine infection. Thus A. P. Mitchell of Edinburgh, in a study of 72 cases of cervical adenitis in children, found bovine bacilli in 65 cases. Of the children two years old or under, 84 per cent. were fed on unboiled cow's milk. J. Frazer in 100 cases of bone tuberculosis, found 62 yielding bovine bacilli, and 73 per cent. of the children were under three years old and had been fed raw milk. Park and Krumweide, in a tabulation of the recorded cases in which the type of bacillus had been determined, ascribed over 50 per cent. of the cases of generalized tuberculosis in children to bovine infection.

Such authorities as Knopf, Rosenau, Delepine, Sims-Woodhead, and Park estimate that about 25 per cent. of all tuberculous children under five years old suffer from infections of bovine origin; and that these cause from six to ten per cent. of the deaths from tuberculosis in children of this age.

The Bureau of Animal Industry estimates that at least 20 per cent. of dairy cows in the United States are afflicted with tuberculosis, while in certain areas the percentage is very much higher. Many of these cows expel bacilli with their milk, while in a large proportion of them, virulent bacilli are found more or less constantly in the intestinal discharges. As manure is the most common and practically a universal contaminant of milk, it constitutes the chief source of the tubercle bacilli in the milk.

It is evident, then, that bovine tuberculosis is a very important factor in the causation of tuberculosis in children, and it is clear for the protection of the child against this form of the disease, it is essential that the milk, butter, and other milk products in his dietary shall be free from living tubercle bacilli.

Certified milk and milk of lower grade if from efficiently tuberculin tested cattle, is reasonably safe; but ordinary grades can be rendered absolutely safe by but one practicable method, namely, heating to a temperature sufficiently high to kill the bacilli. This is now ostensibly done with such of the market milk as is, either voluntarily or by legal compulsion, subjected to pasteurization; but most commercial pasteurization, unless done under a system of official supervision and control at present impossible in most communities, is absolutely unreliable. The same is true, also, of much of the alleged tuberculin testing. The remedy lies in home pasteurization. Every mother should be taught the dangers of uncooked milk to her children, and should be brought to realize that only by heating the milk in her own kitchen can she obviate this danger. When, and only when, this becomes a universal practice, will bovine tuberculous infections in children be eliminated.

Certain common infectious diseases seem to render children more prone to tuberculosis, and must be noted in any discussion of the prophylaxis of that disease. Measles seems to be especially malevolent in this respect and pertussis only less so. The common cold, if often repeated and neglected, must also be included in this category. While almost every child sooner or later acquires measles, and a very large proportion pertussis, they should be protected as far as possible against these diseases, and every effort made to defer their incidence. The commonly expressed opinion that they are comparatively trivial disorders is highly erroneous, and the doctrine of many mothers and some physicians that children might as well get them over with early is intolerable.

Diseased tonsils have been at times accorded considerable etiological significance as portals for the entrance of tubercle bacilli into the body in cases of pulmonary tuberculosis, it being claimed that they passed to the lungs by direct lymph channels; but histological and bacteriological study of the tonsils reveals tuberculous changes and bacilli in these structures comparatively infrequently, except in individuals having open tuberculosis, and in whom it is probable that the tonsil condition is secondary. In tuberculosis of the cervical lymph nodes, however, the infection undoubtedly does enter through some portion of the lymphoid ring of the pharynx; and adenoids and diseased tonsils so profoundly affect the child's general physical condition that their presence must be considered to predispose to tuberculous infections in other parts of the body. No child is therefore adequately protected against tuberculosis who has bad tonsils or adenoids, and every such child should be subjected to prompt and radical operative treatment. Dental caries is of similar significance, and must be guarded against. Decayed teeth are reservoirs of septic material, and by toxin absorption and interference with the proper performance of the digestive functions, cause, in many children, a degree of malnutrition which markedly lowers their resistance to infections.

A discussion of the general hygienic measures necessary for the prevention of tuberculosis in children would be burdensome at this time, and is unnecessary. All are familiar with the need for pure air in homes and schools; proper clothing; a properly balanced dietary, avoiding both under- and over-feeding; and prevention of indiscriminate kissing of children by servants, friends, or passing strangers. Public parks and playgrounds, milk depots, school diet kitchens, day nurseries, open air schools, medical inspection of schools, limitation of child labor, and legal protection of pregnant and lactating working women; all these need but to be mentioned to recall to your minds their beneficent results.

Many and diverse are the agencies engaged in combating the white plague, but since a large percentage of tuberculous disease has its inception in early childhood, preventive measures which do not include that period of life are futile. Physicians and others interested in this propaganda should therefore insist upon the fundamental importance of the prevention of tuberculosis in children.

Berkeley National Bank Building.